

## Transaction Costs in Applied Trade Models

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To add to Mark Gehlhar's presentation on the role and importance of transportation costs in economy-wide models, I would like to briefly illustrate how to incorporate transportation costs into an applied trade model. I have recently looked at trade patterns in the market for fresh apples, so this will be the subject of my illustration.

Theory suggests that price differences between trading regions cannot exceed transport costs, but much empirical evidence shows that this theory is too constraining. Trade patterns can very rarely be explained by price competition alone. Applied trade analysts are increasingly looking at other factors to explain the direction and volume of trade between regions. These factors include formal and informal regional trade agreements, similarities in demand preferences and in business practices (what O. North refers to as *cultural homogeneity*), and a whole array of transaction costs. Transaction costs include not only transportation costs, as measured by freight rates, but also many other costs such as those associated with obtaining information about trading partners and foreign regulations and for coordinating and monitoring contractual arrangements. It is costly to do business with a country with a different legal system, to verify the credibility of new trading partners, and to ensure yourself against so-called sovereign risk, since property rights cannot be easily enforced in the international arena.

In the market for fruits and vegetables in particular, transaction costs include costs associated with complying with phytosanitary procedures, such as treatment, inspection, or storage costs during quarantine. Food safety and environmental regulations in general also add costs to bringing a product from the point of production to the point of consumption.

The data available, as other presenters have shown us, is rarely detailed enough to allow a breakdown of the different types of costs. Also difficult to figure out from available data, but crucial in policy analysis, is who bears these costs, that is, how are costs distributed between agents along the trading route.

Let me turn to my study of U.S. imports of fresh apples by country of origin to illustrate my point. Thanks to Mark's careful work, I was able to compare unit value at customs (the *fob* value) and at the port of entry (the *cif* value) for the same shipment. The difference between the two can thus be attributed to transaction costs. This information is presented in the following graph and table (figure 6 and table 5).

We note first that although the United States is one of the world's top producers and exporters of fresh apples, it does not import many apples and there are very few foreign suppliers to the U.S. market. Secondly, the value of shipments to the United States can vary a lot from year to year and the selection of 1995 is arbitrary.

The graph shows large differences in both the value of the shipments and the margin between *fob* and *cif* prices. The case of Canada stands out. Both the product value and the transport margins are quite low compared with other suppliers. Most imports from Canada come from Quebec and

Ontario and are shipped to New York and Michigan for processing, which typically commands a much lower price than apples destined for the fresh market. Canadian producers are so close to U.S. processors that apples can be shipped rapidly and economically. The low value of processing apples would not warrant long-distance shipping and high transport costs.

Japan is known for its high-value, high-quality apples. This is reflected on the graph where shipments from Japan show the highest fob value. Transport costs, however, are about equal to the world average. Supplies from South American producers, conversely, have average values but high transport costs.

From this empirical example, we can see that there is no simple relationship between distance and transport costs. In applied trade models, where the aim is to analyze trade patterns and policies, it may be crucial to look at trade flows and to explicitly model transaction costs. One approach to analyzing trade flows is to construct an Armington-type model, which is an import demand model where the traded good (like fresh apples) is differentiated by country of origin. That means, for example, that apples imported to the U.S. market from Japan are not treated as perfect substitutes for apples imported from New Zealand and price differences can occur. Here is a simple illustration of this modeling approach (figure 7).

In conclusion, I would like to add that transaction costs are likely to impact the time dimension of trade flows as much as they impact the spatial dimension. For instance, transaction costs may act as barriers to trade through asymmetric information on new trading partners.